

REMARKS

In the Office Action dated June 28, 2007, claims 9 and 13 were objected to as dependent on withdrawn claims, and claims 9-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over International Publication No. WO 1999/055648 (Bosman). Please reconsider the application in view of the above amendments and the following remarks. Applicant thanks the Examiner for carefully considering this application.

Amendments to the Claims

Claims 1-8 and 17-21 were previously withdrawn in response to a Restriction Requirement, and Applicant elected claims 9-16 without prejudice (contrary to the description of Election / Restriction on page 2 of the Office Action). Please cancel claims 1-8 and 17-21 without prejudice. Applicant expressly reserves the right to pursue these claims in a divisional application.

Claim 9 is currently amended to include the subject matter of claim 1. Claim 13 is currently amended to include the subject matter of claims 1 and 2. No new matter is introduced by these amendments.

Claim Objections

Claims 9 has been rewritten in independent form, amended to include the subject matter of claim 1. Claim 13 has been rewritten in independent form, amended to include the subject matter of claims 1 and 2. As claims 9 and 13 are no longer dependent on withdrawn claims, withdrawal of this objection is respectfully requested.

Rejections Under 35 U.S.C. § 103(a)

Claims 9-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over International Publication No. WO 1999/055648 (Bosman). To the extent this rejection applies to the claims as amended, this rejection is respectfully traversed.

In general, independent claims 9 and 13 are directed toward a process for the selective hydrogenation of acetylenic compounds, where the process includes contacting acetylenic compounds with a catalyst in the presence of hydrogen under conditions of temperature and pressure to at least partially hydrogenate the acetylenic compounds. The catalyst comprises nickel deposited on a porous support having more than about 60% of the nickel deposited on the outer periphery of the porous support.

Applicant has surprisingly found that supported nickel catalysts having more than about 60% of the nickel on the peripheral surface of the support are more selective and efficient than conventional, prior art hydrotreating catalysts (see Abstract, and Specification, page 5, lines 17-20). For example, when used to remove acetylenic compounds from butadiene streams, higher recovery of the desired butadiene with lower acetylenic content and low heavy polymer deposition is obtained than was possible with prior catalysts (see Abstract, and Specification, page 5, lines 20-23). The higher recovery of desired olefins and improved selectivity of the catalysts used in the processes of claims 9 and 13 may allow the elimination of extractive distillation columns currently used to purify olefinic streams (Specification, page 5, lines 23-25).

Bosman discloses the use of a nickel catalyst for the hydrogenation of phenyl acetylene in a styrene-containing medium (Bosman, page 1, lines 10-12). The nickel catalyst is synthesized by (conventional) impregnation of a porous carrier material, using water as a solvent (Bosman, page 3, lines 11-16).

One skilled in the art would recognize Bosman's impregnation as a conventional slurry impregnation or an incipient wet impregnation, especially in reference to commercially available nickel catalysts (see Bosman, page 4, lines 1-4). Applicant is unaware of any prior art nickel catalysts that are available or commercially available where a majority of the nickel is deposited on the outer periphery of the support (see Specification, page 7, line 30 to page 8, line 1). Applicant has found that a supported nickel catalyst having at least 60% of the nickel on the outer periphery of the support may lead to increased activity and selectivity, and discloses, among other methods, that such a catalyst may be formed by a spray coating process (see Specification at page 8, lines 5-31, and the Examples).

The Examiner admits that "Bosman does not specifically disclose that the catalyst comprises more than about 60 percent of the Ni deposited on the outer periphery of said porous support" (Office Action, page 3, paragraph 2). In formulating the obviousness rejection, the Examiner erroneously asserts that "Bosman teaches that the higher the catalyst deposited on the surface area, the better the acetylene is hydrogenated" (Office Action dated June 28, 2007, page 3, third paragraph). In fact, as noted by Bosman at page 3, lines 26-29, use of a higher amount of nickel may result in decreased activity due to clogging of the pores, and a decrease in the dispersion of the catalyst.

Bosman discloses that a high degree of dispersion of the nickel on the carrier results in a catalyst with a large catalytically active surface area (Bosman, page 3, lines 19-21). The higher the catalytically active surface area in the catalyst, the better the phenyl acetylene is hydrogenated (Bosman, page 3, lines 21-23).

As written, Bosman, in fact, teaches away from the use of the catalyst required in claims 9 and 13. Bosman indicates that it is preferred to have the nickel dispersed throughout the catalyst, taking advantage of the large total surface area and pore volume distribution of the

catalyst. Thus, to achieve the high degree of dispersion, Bosman must disperse the catalyst throughout the pores evenly, resulting in a high catalytically active surface area in the catalyst (*i.e.*, in the pores of the catalyst). In contrast, claims 9 and 13 require a catalyst where at least 60% of the nickel is located on the outer periphery of the support material. Thus, whereas Bosman requires an even distribution of nickel, Applicant has surprisingly found that concentrating the nickel content on the outer periphery of the support material leads to improved catalyst activity and selectivity.

As detailed in the arguments above, Bosman fails to teach, disclose, or suggest a hydrogenation process using a supported nickel catalyst where at least 60% of the nickel is deposited in the peripheral outer layer of a shaped support, as required by claims 9 and 13. Thus, claims 9 and 13 are patentable over Bosman. Dependent claims are patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Further regarding claim 13, the catalyst further comprises at least one of Cu, Pd, Re, Zn, Mg, Mo and Bi. Bosman discloses that nickel catalysts normally have a lower activity and selectivity than palladium catalysts (page 2, lines 16-24).

The Examiner asserts that it would have been obvious for one skilled in the art to utilize Pd "because Bosman acknowledges that Pd has higher activity and selectivity than nickel catalyst." In forming this conclusion, the Examiner failed to recognize that Applicant is modifying the nickel catalyst, and is not replacing the nickel catalyst with a palladium catalyst, as may be the intent inferred by the cited passage in Bosman. More importantly, in contrast to the Examiner's assertion, Applicant has found that the catalysts used in the present process have a higher selectivity and activity than the palladium catalysts, as described in the Examples.

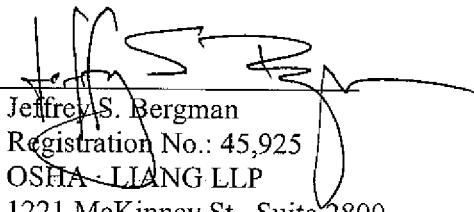
As detailed in the arguments above, Bosman fails to teach, disclose, or suggest a hydrogenation process using a supported nickel catalyst where at least 60% of the nickel is deposited in the peripheral outer layer of a shaped support, and wherein the supported nickel catalyst is modified using at least one of Cu, Pd, Re, Zn, Mg, Mo, and Bi, as required by claim 13. Thus, claim 13 is patentable over Bosman. Dependent claims are patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 17344/131002).

Dated: August 27, 2007

Respectfully submitted,

By


Jeffrey S. Bergman
Registration No.: 45,925
OSHA LIANG LLP
1221 McKinney St., Suite 2800
Houston, Texas 77010
(713) 228-8600
(713) 228-8778 (Fax)
Attorney for Applicant

Attachments